IMPERFECT COMPETITION AND THE SUBOPTIMALITY OF RATIONAL EXPECTATIONS

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A B S T R A C T

This paper investigates whether "nonrational" expectations can lead to outcomes which, other things being equal, Pareto dominate rational expectations outcomes. This investigation is carried out in an intertemporal model with imperfect competition where prices and quantities are set by fully rational maximizing agents. In this model the first theorem of welfare holds, so that the Walrasian equilibrium with rational expectations cannot be Pareto dominated. This conclusion is extremely fragile, however, and we show that at soon as some degree of imperfect competition is present, rational expectations are suboptimal, in the sense that they are dominated by "irrational expectations".

Keywords : Rational Expectations, Imperfect Competition, Optimality.

Journal of Economic Literature Classification Numbers : 021, 022, 023.

CONCURRENCE IMPARFAITE ET SOUS-OPTIMALITE DES ANTICIPATIONS RATIONNELLES

R E S U M E

On se pose dans cet article la question suivante : Est-il possible que des anticipations "irrationnelles" conduisent à des états d'équilibre qui, toutes choses égales par ailleurs, dominent ceux correspondant à des anticipations rationnelles ? Pour y répondre nous construisons un modèle intertemporel avec concurrence imparfaite, où les prix et les quantités sont déterminés rationnellement par des agents maximisant leur fonction objectif. Dans ce modèle le premier théorème du bien être est valide, et l'équilibre Walrasien avec anticipations rationnelles ne peut être dominé au sens de Pareto. Cette conclusion est toutefois très fragile, et nous montrons que, dès lors que des éléments de concurrence imparfaite appraissent, les anticipations rationnelles sont sous-optimales, c'est-à-dire dominées au sens de Pareto par des anticipations "irrationnelles".

Mots clefs : Anticipations rationnelles, concurrence imparfaite, optimalité

Codes J.E.L. : 021, 022,023.

1. INTRODUCTION (*)

Can nonrational expectations lead to outcomes which, other things being equal, Pareto dominate rational expectations outcomes ? This is of course an important issue if one wants to take a normative view in favor of rational expectations. Obviously this question can be posed in various frameworks. For example in an Arrow-Debreu world the answer to it is clearly negative, because the rational expectations equilibrium is a Pareto optimum.On the other hand there exist a few studies in the literature which, considering frameworks different from the Arrow-Debreu one, bring a positive answer to this question. Notably Persson-Svensson (1983) (See also Benassy, 1986, Neary-Stiglitz, 1983) show that this may be true in fixprice-type models. For example it benefits the agents to be "optimistic" when the economy is stuck in a "Keynesian" excess supply situation. In a different framework, Teit Nielsen (1988) shows that in an overlapping generations model with fiat money, a large number of perfect foresight equilibria are dominated by imperfect foresight equilibria starting from the same initial conditions.

Of course some objections may be made against these results. In the fixprice type models the prices are given arbitrarily and at "wrong" values, so that some "irrationality" is already introduced in the model. In the overlapping generations model, the dominated perfect foresight Walrasian equilibria are very particular Walrasian equilibria which, because of the special structure of overlapping generations models, do not satisfy the first theorem of welfare. And actually the Walrasian equilibrium which satisfies this theorem, i.e. the stationary state with positively valued fiat money, is not Pareto dominated.

(*) I wish to thank Bruno Jullien for his useful comments on earlier versions of this paper. Of course I remain sole responsible for remaining errors and opinions expressed.

So what we want to do in this paper is to study the question asked at the beginning of this introduction in a framework which responds to the above objections : First, and contrarily to the "fixprice" case, prices will be endogenously and rationally determined by agents through explicit maximization of the relevant criterion (utility or profits). Secondly, although we shall use for its convenience an overlapping generations model, we shall consider only the stationary states where money has a positive value, that is the case where the first theorem of welfare holds for the Walrasian equilibrium.

We shall show in such a model that the result obtained in the traditional Walrasian world is not a robust one, that is, as soon as one is not in the extreme case of perfect competition, rational expectations outcomes can be dominated by irrational expectations ones, eventhough prices are determined by fully rational agents.

2. THE MODEL

The model is an overlapping generations with fiat money similar to that in Benassy (1989, a,b). The agents are firms, indexed by $j = 1,\dots,n$ and households, indexed by $i = 1,\dots,n$ (1) , living two periods each.

The goods in the economy are fiat money, consumer goods indexed by $j = 1,\dots,n$ and labor types indexed by $i = 1,\dots,n$. Firm j is the only one to produce good j , and sets the money price p_j . Household i is the only one to sell labor i , and sets the wage w_i. Define the price and wage vectors :

$$p = \{p_j \mid j = 1,\dots,n\} \quad w = \{w_i \mid i = 1,\dots,n\}$$

Firm j uses labor inputs ℓ_{ij} , $i = 1,\dots,n$ to produce output y_j , according to the production function :

(1) We take the same number of firms and households only to simplify the notation. Having a different number is a trivial extension (See for example Benassy, 1987, 1989a, 1990), but would make exposition more clumsy at some points.

$$y_j = F(\ell_j) \tag{1}$$

where F is strictly concave and the scalar ℓ_j is an index of the ℓ_{ij}'s :

$$\ell_j = \Lambda(\ell_{1j}, \ldots, \ell_{nj}) \tag{2}$$

The function Λ is assumed to be homogeneous of degree one and symmetric in its arguments. We assume moreover that the index is normalized so that :

$$\Lambda(\ell/n, \ldots, \ell/n) = \ell \tag{3}$$

The firm's objective is to maximize profits :

$$\pi_j = p_j\, y_j - \sum_{i=1}^{n} w_i\, \ell_{ij} \tag{4}$$

Household i has an initial endowment of labor ℓ_0 . In the first period of his life he sets the wage w_i and works a quantity ℓ_i :

$$\ell_i = \sum_{j=1}^{n} \ell_{ij} \le \ell_0 \tag{5}$$

Household i consumes quantities of consumption goods c_{ij} , j = 1,...,n in the first period of his life and c'_{ij} , j = 1,...,n in the second one. He has a utility function :

$$U_i = U_i(c_i, c'_i, \ell_0 - \ell_i) \tag{6}$$

where c_i and c'_i are scalar indexes of the c_{ij}'s and c'_{ij}'s respectively :

$$c_i = V(c_{i1}, \ldots, c_{in}) \tag{7}$$

$$c'_i = V(c'_{i1}, \ldots, c'_{in}) \tag{8}$$

The function V is assumed to be homogeneous of degree one and symmetric in its arguments. We assume moreover :

$$V(c/n,\dots,c/n) = c \tag{9}$$

Each household owns a share 1/n of each firm, and receives *when old* an amount of profits π_i :

$$\pi_i = \frac{1}{n} \sum_{j=1}^{n} \pi_j \tag{10}$$

The old household i thus faces the budget constraint :

$$\sum_{j=1}^{n} p_j \, c'_{ij} = \bar{m}_i + \pi_i \tag{11}$$

where $\bar{m}_i$ is the quantity of money transferred as savings from the previous period. As for the young household i he faces two budget constraints (one for each period) :

$$\sum_{j=1}^{n} p_j \, c_{ij} + m_i = w_i \, \ell_i \tag{12}$$

$$\sum_{j=1}^{n} p'_j \, c'_{ij} = m_i + \pi^e_i \tag{13}$$

where p'_j is the price of good j next period (which we shall assume to be always correctly forecasted) and π^e_i is next period's expected profits, which may differ from the profits which will actually be realized in the following period. These expected profits (in real terms) will be the expectational variable we shall be concerned with in what follows.

3. THE IMPERFECTLY COMPETITIVE EQUILIBRIUM

As we indicated earlier, firm j sets the price p_j , household i sets the wage w_i , using objective demand curves which we shall now briefly describe.

3.1. Objective Demand Curves

Following the methodology in Benassy (1987, 1988, 1990), we define the objective demand given a price vector (p,w) as the demand forthcoming at a fixprice equilibrium corresponding to (p,w). Because sellers set the prices, we shall be in a situation where all agents are supply constrained, and transactions are determined by effective demands. Let us now compute these effective demands.

Consider first firm j . At given wages and prices, its profit maximization program A_1 is :

$$\begin{aligned} &\text{Max } \pi_j = p_j\, y_j - \sum_{i=1}^{n} w_i\, \ell_{ij} \qquad \text{s.t.} \\ &F[\Lambda(\ell_{1j},\ldots,\ell_{nj})] = y_j \end{aligned} \tag{A_1}$$

where y_j is demand determined. The solutions in ℓ_{ij} are :

$$\ell_{ij} = \phi_i(w)\, F^{-1}(y_j) \tag{14}$$

where $\phi_i(w)$, a function associated to Λ by duality, is homogeneous of degree zero in wages. As an example (cf. Section 5 below) $\phi_i(w)$ will be approximately isoelastic if Λ is C.E.S. and n is large.

Consider now the old household i . His program is

$$\begin{aligned} &\text{Maximize } c'_i = V(c'_{i1},\ldots,c'_{in}) \qquad \text{s.t.} \\ &\sum_{j=1}^{n} p_j\, c'_{ij} = \bar{m}_i + \pi_i \end{aligned} \tag{A_2}$$

The solution is :

$$c'_{ij} = \phi_j(p)\, \frac{\bar{m}_i + \pi_i}{P} \tag{15}$$

where $\phi_j(p)$ is associated to V and homogeneous of degree zero. P is the price index associated to V , and is related to the functions ϕ_j by :

$$P = \sum_{j=1}^{n} p_j \, \phi_j(p) \tag{16}$$

Now the program of the young household i yielding current consumptions c_{ij} is, merging the two budget constraints (10) and (11) into a single one :

$$\begin{aligned} &\text{Maximize } U(c_i, c'_i, \ell_0 - \ell_i) \qquad \text{s.t.} \\ &\sum_{j=1}^{n} p_j \, c_{ij} + \sum_{j=1}^{n} p'_j \, c'_{ij} = w_i \, \ell_i + \pi^e_i \end{aligned} \tag{A_3}$$

where w_i and ℓ_i are exogenous to i and π^e_i , the forecasted level of profits he will receive in the next period, is taken as parametric for the moment. The solution to this program is :

$$c_{ij} = \phi_j(p) \, c_i \tag{17}$$

where $\phi_j(p)$ is the function already used in equation 13 and c_i is determined by the following program :

$$\begin{aligned} &\text{Maximize } U_i(c_i, c'_i, \ell_0 - \ell_i) \qquad \text{s.t.} \\ &Pc_i + P'c'_i = w_i \, \ell_i + \pi^e_i \end{aligned} \tag{A_4}$$

where P' is next period's price index. We shall denote the solution in c_i of this program as :

$$c_i = C\left(\frac{w_i}{P} , \ell_i , \frac{\pi^e_i}{P} , \sigma \right) \tag{18}$$

where σ = P'/P .The value of the demand forthcoming to firm j , y_j , is simply the sum of individual demands coming from the young and old households :

$$y_j = \sum_{i=1}^{n} c_{ij} + \sum_{i=1}^{n} c'_{ij}$$

which, using equations (15), (17) and (18) yields :

$$y_j = \phi_j(p) \sum_{i=1}^{n} \left[\frac{\bar{m}_i}{P} + \frac{\pi_i}{P} + C\left(\frac{w_i}{P} , \ell_i , \frac{\pi_i^e}{P} , \sigma \right) \right] \tag{19}$$

furthermore we have :

$$\sum_{i=1}^{n} \pi_i = \sum_{j=1}^{n} \pi_j = \sum_{j=1}^{n} p_j y_j - \sum_{i=1}^{n} w_i \ell_i \tag{20}$$

so that :

$$y_j = \phi_j(p) \left[\sum_{i=1}^{n} \frac{\bar{m}_i}{P} + \sum_{j=1}^{n} \frac{p_j y_j}{P} - \sum_{i=1}^{n} \frac{w_i \ell_i}{P} + \sum_{i=1}^{n} C\left(\frac{w_i}{P} , \ell_i , \frac{\pi_i^e}{P} , \sigma \right) \right] \tag{21}$$

Summing equation (14) on the j's yields

$$\ell_i = \phi_i(w) \sum_{j=1}^{n} F^{-1}(y_j) \tag{22}$$

The solution in y_j and ℓ_i of the system of equations (21), $j = 1,\dots,n$ and equations (22), $i = 1,\dots,n$, will give us the objective demands for goods and labor respectively. As the model is symmetrical, we shall further take :

$$\bar{m}_i = \bar{m} \qquad \pi_i^e/P = \theta \qquad \forall\ i \tag{23}$$

where θ is the current real value of expected profits for each household. We shall thus denote these objective demand curves as :

$$y_j = Y_j(p, w, \bar{m}, \theta, \sigma) \qquad j = 1,\dots,n \tag{24}$$

$$\ell_i = L_i(p,w,\bar{m},\theta,\sigma) \qquad i = 1,\dots,n \tag{25}$$

We may note that, in view of the form of equations 21 - 22, for large n the elasticities of Y_j with respect to p_j and L_i with respect to w_i are well approximated by those of $\phi_j(p)$ and $\phi_i(w)$ respectively.

3.2. Price and wage setting

To find its optimal price, the firm solves the following program in p_j :

$$\text{Maximize } p_j y_j - \sum_{i=1}^{n} w_i \ell_{ij} \qquad \text{s.t.}$$

$$\begin{cases} y_j = F(\ell_j) \\ y_j \le Y_j(p,w,\bar{m},\theta,\sigma) \end{cases} \tag{A_5}$$

We assume this program has a unique solution, denoted as :

$$p_j = \psi_j(p_{-j},w,\bar{m},\theta,\sigma) \tag{26}$$

where $p_{-j} = \{p_k \mid k \neq j\}$.

The young household i similarly solves the following program in w_i :

$$\text{Maximize } U_i(c_i,\ c'_i,\ell_0-\ell_i) \qquad \text{s.t.}$$

$$\begin{cases} Pc_i + P'c'_i = w_i\ \ell_i + P\ \theta \\ \ell_i \le L_i(p,w,\bar{m},\theta,\sigma) \end{cases} \tag{A_6}$$

which, assuming again a unique solution, yields the optimal wage function :

$$w_i = \psi_i(w_{-i}, p, \bar{m}, \theta, \sigma) \tag{27}$$

where $w_{-i} = \{w_k \mid k \neq i\}$

3.3. Equilibrium

The equilibrium will be a Nash equilibrium in prices and wages conditional on the objective demand curves, i.e. it will be characterized by prices and wages w_i^* and p_j^* such that :

$$w_i^* = \psi_i(w_{-i}^*, p^*, \bar{m}, \theta, \sigma) \qquad i = 1, \ldots, m \tag{28}$$

$$p_j^* = \psi_j(p_{-j}^*, w^*, \bar{m}, \theta, \sigma) \qquad j = 1, \ldots, n \tag{29}$$

the quantities being given by the fixprice equilibrium corresponding to p_j^* and w_i^*, i.e. by equations (14) to (23). We shall assume that the equilibrium is unique (and thus symmetric) so that at this equilibrium :

$$c_i = c \qquad c'_i = c' \qquad \ell_i = \ell \qquad \pi_i = \pi \qquad w_i^* = w^* \qquad \forall\ i \tag{30}$$

$$y_j = y \qquad \ell_j = \ell \qquad \pi_j = \pi \qquad p_j^* = p^* \qquad \forall\ j \tag{31}$$

$$\ell_{ij} = \ell/n \qquad c_{ij} = c/n \qquad c'_{ij} = c'/n \qquad \forall\ i,j \tag{32}$$

$$P = p^* \qquad W = w^* \tag{33}$$

This equilibrium depends of course upon $\bar{m}$, θ and σ. Because of the homogeneity properties of the model, equilibrium prices and wages are proportional to $\bar{m}$, whereas quantities do not depend on $\bar{m}$ (see Benassy 1987, 1989a, 1990, for more general statements on this).

3.4. Stationary Equilibria

Though our model can be used to study nonstationary states as well, for the reasons indicated in the introduction we shall restrict ourselves here to stationary equilibria for which :

$$\sigma = 1 \qquad\qquad P' = P = p^{*} \tag{34}$$

What we shall mostly be interested in here is the dependence on θ, the real expected level of profits. A benchmark case will be the rational expectations, or perfect foresight case, for which we will have the additional equation

$$\theta = \pi/p \tag{35}$$

which defines the rational expectations equilibrium. We shall denote by $\hat{\theta}$ the value of θ at this stationary rational expectations equilibrium. We are now almost ready to answer the question asked at the beginning of this paper, but before that we shall characterize a little more our equilibria.

<u>3.5. A Characterization</u>

For what follows it will be useful to characterize the equilibrium prices and quantities with the help of programs A_5 and A_6 above. Consider first the program yielding firm j's optimal actions :

$$\text{Maximize } p_j y_j - \sum_{i=1}^{n} w_i \ell_{ij} \qquad \text{s.t.}$$

$$\left\{ \begin{array}{l} y_j = F(\ell_j) \\ \\ y_j = Y_j(p, w, \bar{m}, \theta, \sigma) \end{array} \right. \tag{A_5}$$

Assuming an interior solution the Kuhn-Tucker conditions yield :

$$\frac{w_i}{p_j} = \left(1 - \frac{1}{\eta_j} \right) \frac{\partial F(\ell_j)}{\partial \ell_{ij}} \tag{36}$$

where η_j is the absolute value of the elasticity of the function Y_j with respect to p_j at the equilibrium point.

Consider now the program of young household i :

$$\text{Maximize } U_i(c_i,\ c'_i, \ell_0-\ell_i) \qquad \text{s.t.}$$

$$\left\{ \begin{array}{l} \sum_{j=1}^{n} p_j c_{ij} + \sum_{j=1}^{n} p'_j\ c'_{ij} = w_i\ \ell_i + P\ \theta \\ \ell_i \le L_i(p,w,\bar{m},\theta,\sigma) \end{array} \right. \qquad (A_6)$$

Note that in the general case (i.e. whether expectations are rational or not) this program yields c_i and ℓ_i . If in addition expectations are rational it yields also c'_i . The Kuhn-Tucker conditions associated to this program at the rational expectations equilibrium are thus, calling λ_i the "marginal utility of income" of household i :

$$\frac{\partial U_i}{\partial c_{ij}} = \lambda_i\ p_j \qquad (37)$$

$$\frac{\partial U_i}{\partial c'_{ij}} = \lambda_i\ p'_j \qquad (38)$$

$$\frac{\partial U_i}{\partial(\ell_0-\ell_i)} = \lambda_i\ w_i\left(1 - \frac{1}{\varepsilon_i}\right) \qquad (39)$$

where ε_i is the absolute value of the elasticity of function L_i with respect to w_i at the equilibrium point.Under the symmetry and stationarity conditions described by equations (30-34), equations (36-39) are rewritten as :

$$\frac{w^*}{p^*} = \frac{\eta-1}{\eta}\ F'(\ell) \qquad (40)$$

$$\frac{\partial U}{\partial c} = \lambda p^* \qquad (41)$$

$$\frac{\partial U}{\partial c'} = \lambda p^* \qquad (42)$$

$$\frac{\partial U}{\partial(\ell_0-\ell)} = \lambda w^* \left(1 - \frac{1}{\varepsilon}\right) \tag{43}$$

4. THE SUBOPTIMALITY OF RATIONAL EXPECTATIONS

We see here that there is only one expectational variable, which we chose to be the real expected level of profits θ . The question asked at the beginning of this article can now be rephrased as : Is the perfect foresight value of θ , i.e. $\hat{\theta}$, the one which maximizes the utility of all agents, or will a deviation from rational expectations increase utility ? For that we shall compute the variation dU of the representative consumer's utility when we consider a small variation $d\theta$ from $\hat{\theta}$

$$dU = \left(\frac{\partial U}{\partial c}\cdot\frac{\partial c}{\partial\theta} + \frac{\partial U}{\partial c'}\cdot\frac{\partial c'}{\partial\theta} + \frac{\partial U}{\partial\ell}\cdot\frac{\partial\ell}{\partial\theta}\right) d\theta \tag{44}$$

Since we are at the rational expectations equilibrium point, then equations (40-43) are valid. Moreover since $c + c' = F(\ell)$, we have :

$$\frac{\partial c}{\partial\theta} + \frac{\partial c'}{\partial\theta} = F'(\ell)\,\frac{\partial\ell}{\partial\theta} \tag{45}$$

Putting together equations 40-45, we find :

$$dU = \lambda p^* \left[1 - \left(1 - \frac{1}{\varepsilon}\right)\left(1 - \frac{1}{\eta}\right)\right] F'(\ell)\,.\,\frac{\partial\ell}{\partial\theta}\,.\,d\theta \tag{46}$$

We first see that if there is perfect competition on the goods and labor markets, i.e. if ε and η are both infinite, then the first order variation around $\hat{\theta}$ is zero (and the second order variation negative under the usual concavity assumptions). The first theorem of welfare holds and the rational expectation outcome is Pareto optimal under perfect competition. But equation (46) also tells us that if there is some degree of imperfect competition, i.e. if either ε or η is not infinite, then it will be Pareto improving to deviate from rational expectations (unless of course we have the particular case where $\partial\ell/\partial\theta = 0$). To know whether it is optimal to be optimistic or pessimistic, we need to know the sign of $\partial\ell/\partial\theta$. This we shall now illustrate through an example.

5. AN EXAMPLE

We shall give here further computations in the case where the utility function U is Cobb-Douglas and the functions Λ and V are C.E.S. [2] :

$$U = \alpha_1 \text{ Log } c + \alpha_2 \text{ Log } c' + \alpha_3 \text{ Log}(\ell_0-\ell) \tag{47}$$

$$\Lambda(\ell_{1j},\ldots,\ell_{nj}) = n \left(\frac{1}{n} \sum_{i=1}^{n} \ell_{ij}^{\frac{\varepsilon-1}{\varepsilon}} \right)^{\frac{\varepsilon}{\varepsilon-1}} \tag{48}$$

$$V(c_{i1},\ldots,c_{in}) = n \left(\frac{1}{n} \sum_{j=1}^{n} c_{ij}^{\frac{\eta-1}{\eta}} \right)^{\frac{\eta}{\eta-1}} \tag{49}$$

Because of the C.E.S. form of (48) and (49) we have :

$$\phi_i(w) = \frac{1}{n} \left(\frac{w_i}{W} \right)^{-\varepsilon} \tag{50}$$

$$\phi_j(p) = \frac{1}{n} \left(\frac{p_j}{P} \right)^{-\eta} \tag{51}$$

If n is large, the objective demand curves are isoelastic with elasticity η for goods and ε for labor (in absolute values). As a result the equilibrium is determined by the following equations :

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(2) Such C.E.S. indices of the Dixit-Stiglitz (1977) type were introduced into the macroframework by Weitzman (1985).

$$\frac{w}{p} = \frac{\eta-1}{\eta} F'(\ell) \tag{52}$$

$$pc = \frac{\alpha_1}{\alpha_1 + \alpha_2 + \beta_3} (w\ell_0 + p\theta) \tag{53}$$

$$w(\ell_0-\ell) = \frac{\beta_3}{\alpha_1 + \alpha_2 + \beta_3} (w\ell_0 + p\theta) \tag{54}$$

$$c' = F(\ell) - c \tag{55}$$

where $\beta_3 = \varepsilon\alpha_3/(\varepsilon-1)$. We can first compute the level of work under rational expectations, $\hat{\ell}$: In this case $p\theta = pF(\ell) - w\ell$, and equation (54) yields :

$$\frac{w}{p}(\ell_0-\ell) = \frac{\beta_3 F(\ell)}{\alpha_1 + \alpha_2} \tag{56}$$

which using (52) and the definition of β_3 can be rewritten as :

$$F'(\hat{\ell})(\ell_0-\hat{\ell}) = \frac{\varepsilon}{\varepsilon-1} \frac{\eta}{\eta-1} \frac{\alpha_3}{\alpha_1 + \alpha_2} F(\hat{\ell}) \tag{57}$$

We may note that $\hat{\ell}$ is an increasing function of both ε and η . Imperfect competition on either the goods or labor markets has an adverse effect on employment. The value of $\hat{\theta}$ is derived from that of $\hat{\ell}$ using the following formula, also valid without rational expectations :

$$\frac{\pi}{p} = y - \frac{w}{p} \ell = F(\ell) - \frac{\eta-1}{\eta} \ell F'(\ell) \tag{58}$$

Now let us take the general case of an arbitrary θ. Again ℓ will be given by equation (54), where w/p is replaced by the value in (52) :

$$\frac{\eta-1}{\eta} F'(\ell)(\ell_0-\ell) = \frac{\beta_3}{\alpha_1 + \alpha_2 + \beta_3} \left[\frac{\eta-1}{\eta} F'(\ell) \ell_0 + \theta \right] \tag{59}$$

Differentiating this expression we find :

$$\frac{\eta-1}{\eta}\left[F''(\ell)\left(\ell_0 - \ell - \frac{\beta_3\ell_0}{\alpha_1+\alpha_2+\beta_3}\right) - F'(\ell)\right] d\ell = \frac{\beta_3\, d\theta}{\alpha_1+\alpha_2+\beta_3} \tag{60}$$

The term which multiplies $F''(\ell)$ in the above expression is equal to, using equations (54) and (52) :

$$\frac{p\,\beta_3\,\theta}{w(\alpha_1+\alpha_2+\beta_3)} = \frac{\eta\,\beta_3\,\theta}{(\eta-1)(\alpha_1+\alpha_2+\beta_3)\,F'(\ell)}$$

So that equation (60) is rewritten

$$\left[\frac{\beta_3\,\ell_0\,\theta}{\alpha_1+\alpha_2+\beta_3}\;\frac{F''(\ell)}{F'(\ell)} - \frac{\eta-1}{\eta}\;F'(\ell)\right] d\ell = \frac{\beta_3\, d\theta}{\alpha_1+\alpha_2+\beta_3} \tag{61}$$

in which we see that

$$\frac{\partial\ell}{\partial\theta} < 0 \tag{62}$$

We thus see, using formula (46), that in this case pessimism will improve employment (contrarily to the "Keynesian" case where optimism usually improves employment). It is interesting to note that differentiating formula (58) yields

$$d\left(\frac{\pi}{p}\right) = \left[\frac{F'(\ell)}{\eta} - \frac{\eta-1}{\eta}\,\ell\,F''(\ell)\right] d\ell \tag{63}$$

so that pessimistic expectations on real profits actually increase the realized ones !

6. CONCLUSIONS

Rational expectations have already been questioned from a positive point of view, according to which it is not reasonable to assume that real life agents have the knowledge necessary to form rational expectations, and secondly because it is not the case that learning processes always converge towards rational expectations. The results of this paper, which show that in the presence of imperfect competition irrational expectations may Pareto dominate rational expectations, lead us to question the rational expectations hypothesis from a normative point of view as well, which is bound to appear when one considers normative government policies. This demonstrates that it is important to have a research program which does not concentrate exclusively on rational expectations, but integrates various other expectations schemes.

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